Space Weather Forecast

Issued on Sunday, 21 May 2023 at 01:31 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Minor/Moderate radio blackouts from X-ray flares expected, with a chance of High activity. Chance of G1/Minor Geomagnetic Storms between 21 and 23 May.

Analysis of Space Weather Activity over past 24 hours
Solar Activity: Solar activity was High, due to a series of five Moderate flares, mainly from a large and extremely magnetically complex region in the northeast quadrant. The largest of these flares resulted in an R2/Moderate radio blackout. A further Moderate flare emanated from a developing region in the southeast quadrant, close to the limb. A further region in the northwest appears to be weakening, after a history of M-class flare activity.

A CME (coronal mass ejection), which left the Sun early on 20 May and is being analysed for an Earth-directed component.

Solar Wind / Geomagnetic Activity: The solar wind has been indicative of a connection to a fast solar wind, with speeds increasing from ambient levels, to reach strong levels through the period. Total magnetic field strength started strong, but has gradually weakened through the period. The north-south component of the magnetic field was initially strongly negative, but has declined to near neutral levels. Geomagnetic activity reached G2 (Kp5) levels between 20/0000-0300UTC, and was at G1 (Kp5) levels between 20/0300-1200UTC, but was Unsettled after this time.

Energetic Particles / Solar Radiation: Solar radiation levels have been at Background levels throughout.

Four-Day Space Weather Forecast Summary
Solar Activity: Solar activity is expected to be mainly Moderate, with a chance of High activity, due to either multiple Moderate flares, or a chance of Strong flares. The main risk region is in the northeast quadrant, which has produced multiple Moderate flares and continues to develop in complexity. Other regions in the southeast and northwest also present a heightened flare risk.

Solar Wind / Geomagnetic Activity: A CME which left the Sun on 17 May may glance the Earth on 21 May, but with relatively low confidence. Further CMEs are under analysis for Earth-directed components, including an eruption from the southwest quadrant early on 21 May. Fast solar winds are expected to decline later on 21 May, but perhaps will not reach ambient levels. An increase is then possible either later 22 or more likely 23 May, due to a coronal hole in centre disc, with speeds of 500-600km/s possible.

Geomagnetic activity is expected to start Quiet to Unsettled on 21 May, becoming Unsettled to Active due to the possible effects of the CME, with a risk of G1/Minor Storms. Further effects are possible during 22 and 23 May due to the residual CME effects and the connection to a coronal hole high speed stream.

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Energetic Particles / Solar Radiation: There is a daily slight chance of S1, largely as a result of a complex region in the eastern hemisphere, with this very gradually rising over the four days as it transits westwards.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	Yes	20	30	30	10
Strong	G3	No	1	10	10	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	70	70	70	60
Very Active	R3 to R5 X	No	20	20	20	10

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	10	10	15	15
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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